Restoration actions should consider the composition of mixed conifer forest to increase resilience in fire-excluded stands


In the Sierra Nevada most historical stand structure studies have focused on drier pine-dominated forests. This paper helps to fill a gap by contributing information on historical structure in more mesic forests with more moderate amounts of moisture.

Historical data are from field data collected at two sites on the Eldorado National Forest (ENF) in 1923 and 1936. The data were collected as part of the Forest Service timber inventory program. Historical data were compared to modern forest inventory analysis (FIA) data collected on the ENF 2001-2010 in forested habitats within the elevation range of the historic data.

Mean annual precipitation, mean April 1st snowpack, and mean annual climate water deficit were strong drivers of total tree density as well as small (6-12 in) and medium (12-24 in)-tree density. Density was high in rain-dominated regions with a low climatic water deficit. Large-tree density (>24 in) was driven by mean June climatic water deficit and slope. The highest densities of large trees were associated with lower June climatic water deficit. Total basal area was also tied to climatic conditions, where high basal area was associated with rain dominated, NE aspects, with shallow slopes and low water deficit.

There has been a structural shift in fir-dominated mixed conifer forests in the Sierra Nevada. While basal area remains similar, small and medium trees have increased in density and large trees have decreased in density over about a 70 year period (the early
The increases in small trees were most pronounced in rain-dominated areas where historical densities also tended to be higher. The loss of large trees was also most pronounced in areas that historically had the highest large tree densities (low relative summer water deficit and shallow slopes). Large-tree losses were more pronounced on gentler slopes where there were historically higher densities of large trees; this is likely due to past timber harvests. This structural shift has likely reduced preferred nesting and roosting habitat for the California spotted owl.

Changes to fir-dominated mixed conifer forests in the Sierra Nevada were more subtle compared to pine-dominated areas. Forest restoration plans should account for differences in forest type in order to restore resilience and encourage adaptation in fire-excluded mixed conifer forests.

**Further reading:**


